

## CLAIMS

1. A surface treated steel sheet comprising:  
a steel sheet;  
a plating layer containing at least one metal selected from the group consisting of zinc and aluminum on at least one surface of the steel sheet; and  
a film on the plating layer, the film containing at least one metal selected from the group consisting of Al, Mg, and Zn, a tetravalent vanadium compound, and a phosphoric acid group.
2. The surface treated steel sheet according to Claim 1, wherein the film is a chromium-free film.
3. The surface treated steel sheet according to Claim 1, wherein the amount of adhesion of the tetravalent vanadium compound per one surface is 1 to 200 mg/m<sup>2</sup> in terms of vanadium.
4. The surface treated steel sheet according to Claim 1, wherein the amount of adhesion of phosphoric acid group per one surface is 5 to 800 mg/m<sup>2</sup> in terms of phosphorous.
5. The surface treated steel sheet according to Claim 1, wherein the thickness of the film is 5 µm or less.

6. The surface treated steel sheet according to Claim 1, wherein the film further contains an organic resin.

7. The surface treated steel sheet according to Claim 6, wherein the amount of adhesion of the organic resin per one surface is 0.5 to 5 g/m<sup>2</sup>.

8. The surface treated steel sheet according to Claim 6, wherein the organic resin is at least one resin selected from the group consisting of water-soluble organic resins and water-dispersible organic resins.

9. The surface treated steel sheet according to Claim 6, wherein the organic resin is a copolymer resin of styrene (a), (meth)acrylic acid (b), a (meth)acrylic ester (c) including an alkyl chain having the carbon number of 1 to 6, and an olefin (d) capable of copolymerizing with these components (a) to (c).

10. The surface treated steel sheet according to Claim 9, wherein the organic resin has a solid content of styrene (a) of 20 to 60 percent by mass, a solid content of (meth)acrylic acid (b) of 0.5 to 10 percent by mass, and a solid content of (meth)acrylic ester (c) including an alkyl chain having the carbon number of 1 to 6 of 20 to 60 percent by mass relative to 100 percent by mass of solid content of the copolymer resin.

11. The surface treated steel sheet according to Claim 1, further comprising an organic resin coating layer having a thickness of 0.01 to 5 μm on the surface of the film.

12. The surface treated steel sheet according to Claim 11, comprising the surface treatment film in which the amount of adhesion of the organic resin per one surface is 0.5 to 5 g/m<sup>2</sup>.

13. The surface treated steel sheet according to Claim 11, wherein the organic resin is at least one resin selected from the group consisting of water-soluble organic resins and water-dispersible organic resins.

14. The surface treated steel sheet according to Claim 11, wherein the organic resin is a copolymer resin of styrene (a), (meth)acrylic acid (b), a (meth)acrylic ester (c) including an alkyl chain having the carbon number of 1 to 6, and an olefin (d) capable of copolymerizing with these components (a) to (c).

15. The surface treated steel sheet according to Claim 14, wherein the organic resin has a solid content of styrene (a) of 20 to 60 percent by mass, a solid content of (meth)acrylic acid (b) of 0.5 to 10 percent by mass, and a solid content of (meth)acrylic ester (c) including an alkyl chain having the carbon number of 1 to 6 of 20 to 60 percent by mass relative to 100 percent by mass of solid content of the copolymer resin.

16. The surface treated steel sheet according to any one of Claims 1 to 15, wherein the plating is an alloy plating of zinc and aluminum, containing 25 to 75 percent by mass of aluminum.

17. A method for manufacturing a surface treated steel sheet, the method comprising the steps of adhering a treatment solution containing at least one metal selected from the group consisting of Al, Mg, and Zn, a tetravalent vanadium compound, and a phosphoric acid group to a plating layer containing at least one metal selected from the group consisting of zinc and aluminum, the plating layer disposed on at least one surface of a steel sheet and, thereafter, conducting drying at a peak sheet temperature of 60°C to 250°C.

18. The method for manufacturing a surface treated steel sheet according to Claim 17, wherein the treatment solution further contains an organic resin.

19. The method for manufacturing a surface treated steel sheet according to Claim 17, further comprising the steps of adhering a treatment solution containing an organic resin, following the drying step, and conducting drying at a peak sheet temperature of 60°C to 250°C.

20. The method for manufacturing a surface treated steel sheet according to Claim 18 or Claim 19, wherein the organic resin is a copolymer of styrene (a), (meth)acrylic acid (b), a (meth)acrylic ester (c) including an alkyl chain having the carbon number of 1 to 6, and an olefin (d) capable of copolymerizing with these components (a) to (c).

21. The method for manufacturing a surface treated steel sheet according to any one of Claims 17 to 19, wherein the plating is an alloy plating of zinc and aluminum, containing 25 to 75 percent by mass of aluminum.

22. A surface treated steel sheet exhibiting excellent corrosion resistance and film appearance, the surface treated steel sheet characterized in that a surface treatment film containing a vanadium compound having a valence of four, a phosphoric compound, and a compound of at least one metal selected from the group consisting of Al, Mg, and Zn is disposed on a surface of a steel sheet plated with at least one type selected from the group consisting of a zinc based type, an aluminum based type, and an Al-Zn based type.